CLAIMS

1.   An image capture apparatus comprising:

a digital camera 101 comprising a detector 107 having a plurality of
5   detection elements;

an illumination source 106 configured to emit light which illuminates a
document 102 to be captured;

a read-out circuit 108 configured to capture a captured image of said
document from said detector 107, said captured image comprising a
10   plurality of data values;

a memory 111 which accommodates calibration information dependent
upon an illumination profile of said light incident upon said document from
said illumination source 106; and

a processor 112 configured to process each of said plurality of data values
15   in said captured image according to said calibration information to produce
a final image in which effects of non-uniformity of illumination of said
document have been substantially removed.

2.   Apparatus according to claim 1 wherein said calibration information
20   comprises a plurality of calibration values corresponding to respective data
values in said captured image.

3.   Apparatus according to claim 2 wherein each calibration value
corresponds to a data value produced by a respective detection element in
25   said detector 107 when capturing an image of a predetermined test sample.

4.   Apparatus according to claim 2 wherein said calibration values
comprise scaling values, each scaling value dependent upon a data value
obtained from a detection element when capturing an image of a
30   predetermined test sample.

5.   Apparatus according to claim 2 wherein said captured image comprises one data value for each detection element in said detector and in which said memory stores a calibration value for each of said data values in said captured image.

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6.   Apparatus according to claim 2 wherein said memory 111 stores calibration values for a selection of said detection elements and said processor means is configured to interpolate between two or more of said stored calibration values to determine a calibration value for an individual

10   data value in said captured image.

7.   Apparatus according to claim 1 wherein said detector 107 comprises a colour detector comprising at least two sets of detection elements arranged in a predetermined pattern, a first one of said sets of detection

15   elements having a first spectral sensitivity and a second one of said sets having a second, different, spectral sensitivity, said read-out circuit being configured to capture an image of said document which comprises two sets of data values, a first set comprising a plurality of data values obtained from said first detection elements and said second set comprising a

20   plurality of data values obtained from said second set of detection elements, and wherein said memory stores at least two subsets of calibration information, with one sub-set for each of the two parts of the captured image.

25   8.   Apparatus according to claim 7 wherein which three sets of detection elements are provided, each having a different spectral response and said read-out circuit is configured to capture a third set of data values in addition to said first set of data values and said second set of data values.

30   9.   Apparatus according to claim 8 wherein said data values defining said first, second and third sets of data values are processed with said

calibration information prior to colour plane construction of said final image.

10. Apparatus according to claim 1 which further includes a low pass filter and wherein said processor passes said calibration information through said low pass filter.

11. Apparatus according to claim 10 wherein said low pass filter is a spatial domain filter.

12. Apparatus according to claim 1 which includes a test document of known colour, and wherein said read-out circuit 108 is configured to capture a test image corresponding to said test document, said processor being configured to determine said calibration information from said test image and store said calibration information in said memory 111.

13. Apparatus according to claim 12 wherein said test document comprises an image having a uniform reflectivity and colour.

14. Apparatus according to claim 1 wherein said processor 112 is arranged to determine an average data value for a detection element in a number of captured images, and to generate calibration values from said average data value.

15. Apparatus according to preceding claim 1 wherein an additional illumination source 106a,106b is provided which illuminates said document 102, said apparatus capturing a first image when said document is illuminated by said first illumination source 106a, capturing a second image when said document is illuminated by said second illumination source 106b, and combining said first image and said second image to produce said final image.

16. Apparatus according to claim 15 wherein said data values of each of said first image and said second image are processed with said calibration information prior to combining said two images.

5 17. A method of capturing an image of a document, said method comprising the steps of:

providing a test document to be captured;

illuminating said test document with light from a light source;

providing a detector having a plurality of detection elements,

10 capturing an image of said illuminated test document from said detector, said captured image comprising a plurality of data values;

and processing said data values in said captured image in combination with a calibration information indicative of an illumination profile of said light source across said document to produce a final image.

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18. A data carrier which includes a computer program which when running on a computer connected to a camera provides apparatus according to claim 1.

20 19. An image capture apparatus for capturing an image of a document comprising:

a digital camera 101 comprising a colour detector 107 having at least two sets of detection elements arranged in a predetermined pattern, a first set of said two sets of detection elements having a first spectral sensitivity and a

25 second set of said two sets of detection elements having a second, different non uniform special sensitivity,

an illumination source 106 configured to emit light which illuminates said document to be captured with light having an illumination profile; a read-out circuit 108 configured to capture on image of said document from said

30 detector 107, said captured image comprising at least two sets of data values, a first set of said data values comprising a plurality of data values obtained from said detection elements of said first set of detector elements

and a second set of said data values comprising a plurality of data values obtained from said second set of detection elements a memory 111 which accommodates at least four sub sets of calibration information dependent said illumination profile of said light incident upon said document from

5   said illumination source 106, with one of said sub-sets for each of said two sets of data values; and

a processor 112 configured to process each of said plurality of data-values in said captured image with said calibration information to produce an image of said documents in which the effects of non-uniformity of said

10   illumination profile have been substantially removed.

20.   Apparatus according to Claim 19 wherein said calibration information comprises a plurality of calibration values corresponding to respective data values in said captured image.

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21.   Apparatus according to Claim 20 wherein each calibration value corresponds to a data value produced by a respective detection element of said detector 107 when capturing an image of a predetermined test sample.

20   22.   Apparatus according to Claim 20 wherein said calibration values comprise scaling values with each of said scaling values dependent upon a respective data value obtained from a detection element of said camera when capturing an image of a predetermined test sample.

25   23.   Apparatus according to Claim 19 wherein said captured image comprises one data value for each detection element in said detector and in which said memory stores a calibration value for each of said data values in said captured image.

30   24.   Apparatus according to Claim 20 wherein said memory 111 stores calibration values for a fewer than the total number of said detection elements and said processor is configured to interpolate between two or

more of said stored calibration values to determine said calibration value for an individual data value in said captured image.

25.   Apparatus according to Claim 19, wherein three sets of detection elements are provided, each having a different spectral response and said read-out circuit is configured to capture a third set of data values in addition to said first set of data values and said second set of data values.

26.   Apparatus according to Claim 25 wherein said data values defining said first, second and third set of data values are processed with said calibration information prior to colour plane construction of said final image.

27.   Apparatus according to Claim 19 which further includes a low pass filter and wherein said processor passes said calibration information through said low-pass filter.

28.   Apparatus according to Claim 19 wherein said low pass filter is either a frequency domain or spatial domain filter.

29.   Apparatus according to Claim 19 which includes a test document of known colour, and in which said read-out circuit 108 is configured to capture a test image corresponding to said test document, said processor being configured to determine said calibration information from said test image and store said calibration information in said memory 111.

30.   Apparatus according to Claim 29 wherein said test document comprises an image having a uniform reflectivity and colour.

31.   Apparatus according to Claim 19 wherein said processing means 112 is arranged to determine an average data value for a detection element

across a number of captured images, and to generate calibration values from said average value.

32. Apparatus according to Claim 19 wherein an additional illumination source 106a, 106b, is provided which illuminates said document 102, said apparatus capturing a first image when said document is illuminated by said first illumination means 106a, capturing a second image when said document is illuminated by said second illumination means 106b, and combining said two images to produce said final image.

33. Apparatus according to Claim 32 wherein said data values of each of said two captured images are processed with said calibration information prior to combining said two images.

34. An image capture apparatus for capturing an image of a document comprising:

a digital camera 101 comprising a detector 107 having a plurality of detection elements;

a first illumination source 106a configured to emit light which illuminates said document 102 to be captured;

a second illumination source 106b configured to emit light which illuminates said document 102 to be captured

a read-out circuit 108 configured to capture a first image of said document from said detector 107, when illuminated by said first illumination source and a second image when said document is illuminated by said second illumination source the captured image comprising a plurality of data values;

a memory 111 which accommodates a first set of calibration information dependent upon the illumination profile of said light incident upon said document from said first illumination source means 106a and a second set of calibration information dependent upon the illumination profile of said light upon said document from said second illumination source; and

a processor 112 configured to process each of the plurality of data values in said first and second captured images according to said calibration information to produce two images in which the effects of non-uniformity of said illumination profiles have been substantially removed, and further

5   to combine said processed images to produce a final image of said document.

35.   Apparatus according to Claim 34 wherein said calibration information comprises a plurality of calibration values corresponding to

10   respective data values in said captured images.

36.   Apparatus according to Claim 35 wherein each calibration value corresponds to a data value produced by a respective detection element in said detector 107 when capturing an image of a predetermined test sample.

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37.   Apparatus according to Claim 35 wherein said calibration values comprise scaling values, each scaling value dependent upon a respective obtained from a detection element when capturing an image of a predetermined test sample.

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38.   Apparatus according to Claim 35 wherein each of said captured images comprise one data value for each detection element in said detector and in which said memory stores a calibration value for each of said data values in said captured image.

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39.   Apparatus according to Claim 35 wherein said memory 111 stores calibration values for a selection of said detection elements and said processor is configured to interpolate between two or more of said stored calibration values to determine a calibration value for an individual data

30   value in said captured images.

40.   Apparatus according to Claim 34 wherein said detector 107 comprises a colour detector comprising at least two sets of detection elements arranged in a predetermined pattern, a first set of detection elements having a first spectral sensitivity and the second set having a

5   second, different, spectral sensitivity, said read-out circuit being configured to capture a first image of the document which comprises two sets of data values, a first detection elements and the second set comprising a plurality of data values obtained from the second set of detection elements, and in which the memory stores at least two subsets of calibration information,

10   with one sub-set for each of the two subsets of calibration information, with one sub-set for each of the two parts of the captured image.

41.   Apparatus according to Claim 40 wherein three sets of detection elements are provided, each having a different spectral response and

15   wherein said read-out circuit is configured to capture a third set of data values in addition to said first set of data values and said second set of data values.

42.   Apparatus according to Claim 8 wherein said data values defining

20   said first, second and third sets of data values are processed with the calibration information prior to colour plane construction of the final image.

43.   Apparatus according to Claim 34 which further includes a low pass

25   filter and in which said processor passes said calibration information through said filter.

44.   Apparatus according to Claim 43 wherein said low pass filter is either a frequency domain filter.

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45.   Apparatus according to Claim 34 which further includes a test document of known colour, and in which said read-out circuit 108 is

configured to capture a test image corresponding to said test document, said the processor being configured to determine said calibration information from said test image and store said calibration information in said memory 111.

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46. Apparatus according to Claim 45 wherein said test document comprises an image having a uniform reflectivity and colour.

47. Apparatus according to Claim 34 wherein said processor 112 10 determines an average data value for a detection element in a number of captured images, and generates calibration values from said average values.

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